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## Description

This invention relates to apparatus to wrap an article or a group of articles in plastic film. There are several commercial methods each with its own apparatus for carrying out such wrapping operations.

One of the methods used is called shrink wrapping and it involves the use of a tube or bag of plastic film, the bag is "set" in an expanded condition in a cooling process as the tube is manufactured. The bag is passed over the article or group of articles to be wrapped as a loose cover and it is then released from the "set" condition by the application of heat. The plastic film shrinks as a result and the article(s) is enveloped in an elastically embracing plastic film sheath.

Machinery has been developed to assist in this process and an example of such machinery is shown in U.S. patent 4,063,401. The patent provides means for assembling a length of plastic film tubing as a loose gathered band of cross-sectional area greater than the article to be wrapped and the lowering to band to form a loose bag over the article. Heat is then applied, as by placing the article in an oven, to release the plastic from its "set". The plastic film shrinks onto the article to provide a protective cover.

This approach to the plastic wrapping problem has the great disadvantage that heat has to be used. As a result the integrity of the film cover can be destroyed if the heat is too great and the plastic melts. If the plastic melts it can adhere to the article being wrapped. If the article or articles to be wrapped are themselves plastic covered there is every possibility that the outer wrapping material will fuse to the article wrapping material. There is also the other problem that the products in the articles to be wrapped may be heat affected.

To overcome these above problems stretch wrapping has been developed. This involves wrapping the article or articles in a bandage of plastic film whilst it is under tension. When the wrapping operation is finished the result is a tightly wound and slightly stretched plastic sheath which encloses the article. There are problems with this method such as maintaining the article stable whilst the tensioned plastic is wrapped around it. There is also the problem of rotating the article so it can be wrapped or rotating the roll of plastic film around the article as part of the wrapping process.

French Patent Specification 2,230,549 is concerned with a wrapping device in which a plastics sleeve is fed into a magazine and folded bellows fashion until there is sufficient plastic sheet in the magazine to cover the whole article to be wrapped. The plastic is stretched sideways to ensure that the article will enter the sleeve. When it is placed in position to be wrapped, the article moves away from the magazine, pulling the plastic folded sheet with it.

The present invention overcomes the problems

of both shrink wrapping and stretch wrapping above and is quicker than any of the known methods. The apparatus of the invention enables especially the puckering operation to be controlled reliably and conducted smoothly avoiding any overlap of puckers which would hinder the stripping of the puckered plastic from the puckering frame.

According to the invention there is provided stretch wrapping apparatus comprising a puckering device to form a length of plastic film material in the form of a tube into a puckered band on a ring frame from which the plastic is stripped as the frame is passed over an object to thereby provide a wrapping for the object, the stretch wrapping apparatus comprising a first rectangular puckering frame a second rectangular, expandable and contractable frame, a holder for a puckered band of plastic film at each corner of the second frame, each holder comprising a pair of spacing band support legs fixed at their upper ends to said second frame, a puckering plate to which the lower ends of each of said support legs are fixed, said puckering plates lying parallel to said support legs, said support legs and said puckering plates disposed in planes at right angles to the plane occupied by said second frame, four jack screw assemblies fixed to said first frame to expand and contract said second frame, said jack screws of the jack screw assemblies respectively fixed to said puckering plates of said holders and disposed in a common plane parallel to the plane occupied by said second frame, four drive shafts extending one from each jack screw assembly at right angles to the axes of said jack screws, a base, four drive heads rotatably mounted on the base engageable by said drive shafts, first drive means on the base to rotate the four drive heads, a sub-base, elevating means connecting said base and sub-base whereby the sub-base is raisable and lowerable relative to the base, four puckering assemblies (belts and support pulleys) mounted on the sub-base, a puckering belt on each puckering assembly extending between a pair of said band support legs and bearing on a puckering plate, a second drive means on said sub-base to simultaneously drive all of said puckering belts and said elevating means.

According to a preferred embodiment there is provided stretch wrapping apparatus as defined in claim 1 in combination with a wheeled transporter for the second frame, two telescopic masts on a base part, each mast having an outer part and an inner part, said first frame fixed to two trolleys respectively mounted one on each inner mast part, mast extending and contracting means and trolley moving means. Further preferred embodiments are defined in the dependent claims.

A presently preferred embodiment of the invention will now be described with reference to the accompanying drawings in which:—

Figure 1 is a perspective view of the apparatus of the invention including an optional transporter means to facilitate the stretch wrapping operation,

Figure 2a shows the apparatus of Figure 1 in a first operation of puckering a length of plastic onto an expandible and contractable frame,

Fig. 2b shows a later stage in the first operation as shown in Fig. 1,

Fig. 2c shows the expansion of the expandible and contractable frame after the puckering operation has been completed,

Fig. 2d shows the use of the optional transporter to move the expandible and contractable frame with its expanded band of plastic film.

Fig. 2e shows the elevation of the expandible and contractable frame with its band of film to a position above the load to be wrapped,

Fig. 2f shows the expandible and contractable frame in a lowering operation during which the expanded plastic film is stripped from the frame and shrinks onto the load being wrapped to form a tight sheath about the load,

Fig. 3 is a schematic plan view of a sub-base assembly of the puckering device carrying the puckering belts,

Fig. 4 is a schematic plan view of the base of the puckering device carrying drive means for the expansion of the expandible and contractable frame.

Fig. 5 is sectional elevation on section line 5—5 of Fig. 6 of a corner assembly of the sub-base showing the inter-relationship of the puckering belt and the expandible and contractable frame.

Fig. 6 is a plan view of a corner assembly,

Fig. 7 is fragmentary elevation showing a transporter mast in a lowered condition,

Fig. 8 is a fragmentary elevation similar to Fig. 7 showing the transporter mast in a raised condition,

Fig. 9 is a fragmentary view of a driving dog arrangement whereby a trolley is raised relative to the transporter mast, and

Fig. 10 is a perspective view of the transporter with the upper portion of the masts removed.

As illustrated there is a puckering device 1 and a transporter 2 which has a second rectangular, expandible and contractable puckering frame 3 mounted thereon so as to be movable from an operating position on the puckering device 1 to a use position over a load to be wrapped. The steps in the operation can be best seen from Fig. 2 and a detailed description of the stages shown in Fig. 2 will be given after a detailed description of the members 1 and 2.

The puckering device 1 broadly comprises a base 4 housing first and second drive means for puckering belts 5 and frame expanding driving heads 6. There is a support frame 7 for rolls of plastic film 8 in the form of a gusseted tube, which may have transverse seal lines to convert the tube into a number of bags. The feed end of the film passes over guide means 9 so as to align it centrally over the base 4. The base 4 is supported on legs 10 each carrying a wheel 11a and there are guide rails 12 joining the front and rear legs 10.

Below the cover 11 there is a sub-base 26 supporting first and second drive means for the

belts 5 and the driving heads 6. The drive means can be best seen from Figs. 3 and 4 and comprise as second drive means (13—18) a first motor 13 coupled through a belt 14 to an idler wheel 15 fixed to a shaft 16 arranged for rotation about a vertical axis in a bearing fixed to the sub-base 26. A small diameter sprocket 17 fixed to the shaft 16 is engaged in a chain 18 which passes around sprockets 19 on shafts 20 (see Fig. 5) to apply a drive to the belts 5 in the following manner.

Each belt 5 is supported on two pulleys 21 and 21a (Fig. 5) fixed to shafts 22 rotatably mounted in a pair of spaced apart members 23 each supported by a pair of links 24, all of the links 24 are connected to a member 25 fixed to the sub-base 26. The members 23, 24 and 25 thus provide a parallel link assembly which can move backward and forward in the directions of the arrow A. The belt 5 and the pulley 21a are preferably of toothed form. The shaft 20 drives the pulley 21a through a universal joint (not shown) but indicated generally as 27, and bevel gears 28. A spring 29 applies a biasing force for the parallel link assembly and a stop 32 by engagement with the member 23 limits the movement of the parallel link assembly in the spring biased direction. There are four such assemblies, one at each corner of the base as will be seen from Fig. 1.

The sub-base 26 is mounted on elevating means, i.e. three jacking screws indicated 30 (see Fig. 3). The upper ends of the screws 30 are rotatably housed in bearings 31 fixed to the sub-base 26 with collars on the screw preventing axial movement of the screws 30 in the bearings 31. The lower ends of the screws are housed in threaded holes in brackets fixed to the base 4. Fixed to each screw 30 there is a sprocket 33 around which the chain 18 also passes. It follows therefore that the motor 13 drives the idler wheel 15 through the belt 14 and the sprocket 17 drives the chain 18 which, through its engagement with the sprockets 19, drives the belts 5. The chain 18 through its engagement with the sprockets 33, rotates the jacking screws 30 to elevate the sub-base 26 relative to the base 4 of the machine, or in the event the rotation of the motor 13 being reversed, lowers the sub-base. The pitch of the threads on the jacking screws 30 and the ratio of the various sprocket sizes and the gearing between the bevel gears 28 is related so as to provide puckering characteristics to be discussed later.

The first drive means (34—43) housed in the base 4 comprises a motor 34 with a pulley 35 fixed to the drive shaft, a belt 36 connects the pulley 35 to a pulley 37 fixed to a shaft 38 mounted for rotation about a vertical axis. A sprocket 39 fixed to the shaft 38 is engaged by a chain 40 which passes around idlers 41 and sprockets 42 on shafts 43, which are drivingly coupled to the driving heads 6. The form of the driving heads 6 is a cup to receive the driven ends 44 of shafts 45 (Fig. 5) forming parts of the second puckering frame 3. The preferred drive means is by two diametrically opposed dome ended lugs in

the cup to engage with two diametrically opposed dome ended lugs on the shaft 45, the shape of the lugs and small arcuate space occupied by them facilitates the entry of the shaft ends 44 into the cups 6.

The second puckering frame 3 is adapted to be mounted on the puckering device 1. The second frame 3 comprises two outer right angled tubular members 46 (Fig. 1) engaged telescopically by two like members 47, but of smaller diameter. The members 46 and 47 have corner mounted depending brackets comprised of two band support legs 48 spaced apart sufficiently to allow the belts 5 to enter therebetween. Behind the legs 48 there are puckering plates 49 connected to the legs 48 by ties 50. The inner faces T (Fig. 6) of the plates 49 are "Teflon" (Trade Mark) covered to provide minimal friction and the frame members 46 and 47 are coated, plated and/or polished for the same reason. It is to be noted that the outermost surfaces of the members 46 and 47 lie outside the planes occupied by the legs 48, see Fig. 1 and Fig. 6. This relationship has a bearing on the retention of a puckered mass of plastics materials on the puckering frame after it is puckered. As will be understood the puckered material around the legs 48 would have to expand slightly to pass back over the members 46 and 47. If there was no requirement to expand, as would be the case if the members 46 and 47 were in the same planes as the legs 48 the plastic would "creep" over the members 46 and 47 in an effort to achieve the pre-stretched condition.

The plates 49 are coupled, as shown, by a ball and socket connections 51 to frame expanding screws 52 (see Fig. 5) which are coupled through level gears 53 to the shafts 45. The bevel gears are housed in gearboxes 54 and the screws 52 are housed in protective tubes 55, (see Fig. 1). It is clear that as the chain 40 is driven by the motor 34 the drive through the heads 6 to the shafts 45 and 52 will result in the second puckering frame 3 being expanded or contracted depending upon which direction of rotation of the motor 34 is chosen.

The second puckering frame 3 includes a mounting frame having corner gusset plates to which the gearboxes 54 are fixed. The second puckering frame is supported by two uprights 57 fixed to a U shaped frame 59. The two legs 60 of the frame 59 are end supported on wheels 61 and there are two locators 62 on the legs 50 to laterally centralise the U-shaped frame 59 relative to the base 4 by engagement with the guide rails 12. To longitudinally locate the frame 59 there are abutment plates, not shown, on a first rectangular puckering frame 63 which abut the uprights 57 of the plastic holding frame, see Fig. 1.

The uprights 57 telescopically house masts which are raised and lowered as follows, see Figs. 7 and 10. The base part 56 of the U frame 59 supports a motor 64 which, through gearing 65, drives shafts 66 rotatably supported in the base part 56. Sprockets 67 fixed to the shafts 66 are connected by chains 68 to sprockets 69 at the feet

of the uprights 57. Endless chains 70 around sprockets 69a paired with the sprockets 69 pass up through the uprights 57 and around sprockets 71 at the upper end of the uprights. One run of each chain 70 is fixed to an inner mast 72 as at 73 so that as the chains 70 are moved the inner mast 72 will move up or down within the uprights 57 supported at the upper and lower ends by wheel sets 74 and 75 respectively. There is a wire rope connection between the inner mast 72 and a trolley 76 supported on wheel sets 77 and 78 engaged with the inner mast 72. The wire rope 79 is fastened at one end to the upper end of the upright 57 at 80 and passes downwardly around a pulley 81 on the inner mast 72. The wire rope then extends upwardly to pass around a pulley 82 at the upper end of the inner mast 72 and then downwardly where the other end of the wire rope is again fixed at 80 to the upper of the upright 57.

The upward run of wire rope 79a passes through a hole in a plate 83 on the trolley 76 and there is a lifter block 84 fixed to the wire rope run 79a. The block 84 has the shape shown in Fig. 9 with a pointed head 85 below which there is a reduced section portion 86 providing a shoulder 87. On the trolley 76 there is a pair of lever arms 88 of L shape pivoted so as to be movable as shown in Fig. 9 so terminal end portions of the arms can be positioned below the head 85 and can be pivoted to a position free of the head, as shown in the enlarged fragmentary view of portion of the trolley shown in Fig. 7. The arms are pivoted about the pivot pins 89 by a control rod 90 slidably mounted in saddle 91 on the trolley by means of pins 92 connecting the control rod 90 to the lever arms 88. The control rods 90 are moved in an upward direction, as the trolleys 76 descend, when the lowermost ends of the control rods 90 engage abutment members 93 on the base 4.

The puckering frame raised operation involves initiating the operation of the motor 64. This causes the rotation of the sprockets 69—69a which will move the chains 70 and as the inner masts 72 are fixed to the chains 73 the inner masts 72 will be raised. Movement of the inner masts 72 will cause a shortening of the wire cables below the trolleys and lengthening of the cables above the trolleys which in turn causes the blocks 84 to move to a higher elevation where they will engage under the plates 83 thereby applying a lifting force to the trolleys. This causes the puckering frame fixed to the trolleys to be raised and the shafts 45 to disengage from the heads 6. The raising of the trolleys is terminated when a desired elevation of the puckering frame has been achieved. It will be noted that as the trolleys rise the control arms 90 are raised free of the abutment members 93 allowing the control rods to move down and because of the arrangement of the lever arms connected thereto they will be pivoted about the pins 92 and the free ends of the lever arms will engage under the shoulders 87 of the lifter blocks 84.

In a lowering operation the motor 64 is operated in the opposite mode of rotation and the

inner masts and trolleys fall due to gravity. However as a downward force needs to be applied to the puckering frame to strip the plastic therefrom in a wrapping operation, as hereinafter explained, the shoulders 57 of the lifter blocks 84 bear on the ends of the lever arms, as shown in Fig. 9. Disengagement of the shoulders 57 from the lever arms is arranged to occur just prior to the shafts 45 bottoming into the heads 6, this is achieved by positioning the engagement elevation of the abutments 93 with the ends of the control rods. The inner mast is lowered for a short distance below the lifting block release position by the lever arms and an automatic interruption of the power supply to the motor 64 can be achieved by a suitable limit switch. A like switch can be used to limit the up travel of the puckering frame.

Once the puckering frame is raised to clear the cover 11 the transporter can be wheeled by the handle H to a use location where the puckered plastic is placed over an object.

The manner of using the equipment just described is as follows. Fig. 2a shows the puckering frame in a working position over the puckering unit with the puckering frame released from the cables within the uprights 57 and the driven ends 44 of the shafts 45 of the gearboxes 54 located in the heads 6. Plastic is then unrolled from the roll 8 and the open end is located around the periphery of the second puckering frame 3. The open end of the plastic is then drawn down over the puckering frame and caught between the belts 5 (which project between the legs 48) and the surfaces T on the puckering plates 49, see Fig. 2b.

By means of the controls C (see Fig. 1) the motor 13 is energised in a first direction which will cause the belts 5 to move in a downward direction, anti-clockwise as shown in Fig. 5, and at the same time the jacking screws 30 will be rotated to cause the sub-base to be raised relative to the base 1. The result is a series of puckers P, as shown in Fig. 5, which do not overlap. The rate of belt feed for puckering and the rate of sub-base elevation is such that no overlap of puckers occurs. If overlap was to occur there would be difficulty in stripping the puckered plastic from the puckering frame.

Puckering is continued until a predetermined amount of plastic has been placed as a puckered band on the second puckering frame 3 around the legs 48 and then the plastic on the second puckering frame is severed from the roll plastic 8, see Fig. 2c, leaving a closed end of a plastic bag extending across the top of the second puckering frame.

Fig. 2c also indicates the next operation which is to energise motor 34 to rotate the heads 6, the shafts 45 and 52 to expand the second puckering frame to a predetermined size which is in excess of the cross-sectional size of the load on the pallet.

Fig. 2d indicates the transportation step which follows the raising of the second puckering frame to release the ends 44 of the shafts 45 from the heads. 6.

Fig. 2e indicates the second puckering frame in a fully raised condition poised over a pallet and load prior to the commencement of the wrapping step.

Fig. 2f indicates to wrapping step during which the second puckering frame is lowered, the plastic bag closed end over the top of the load causes the plastic to strip from the puckering frame as it descends thereby depositing the bag over the load. Immediately upon release from the stretching forces applied by the frame the plastic bag will commence to contract to try and achieve its unstretched condition. As the load on the pallet is greater in cross-section than the unstretched cross-section of the bag it will shrink onto the load where it will remain as a closely embracing skin around the load. The second puckering frame is lowered until the plastic bag is completely stripped from the second puckering frame and the length of the bag is preferably such that the terminal end of the bag will close over the edges of the underface of the pallet. To facilitate this and the stripping of the plastic bag from the second puckering frame the pallet is preferably supported on a raised stand smaller in cross-section than the pallet.

After stripping the plastic bag the second puckering frame is raised and returned to its start position over the base 1.

The controls of the puckering device and the transporter are integrated in the preferred arrangement of the invention and they are interconnected by an aerial cable extending from the top of the legs 7 to an elevated position on the transporter.

Whilst the use of a transporter has been described it will be understood that the puckering frame can be manually delivered to a use station. The use of a transporter is therefore to be considered a preferred manner of handling the puckering frame and not an essential of the apparatus of the invention.

## Claims

1. Stretch wrapping apparatus comprising a puckering device (1) to form a length of plastic film material in the form of a tube into a puckered band on a rectangular puckering frame from which the plastic is stripped as the frame is passed over an object to thereby provide a wrapping for the object, characterised in that the stretch wrapping apparatus comprises a first rectangular puckering frame (63), a second rectangular, expandable and contractable puckering frame (3), a holder (48, 49) for a puckered band of plastic film at each corner of the second frame (3), each holder comprising a pair of spaced band support legs (48) fixed at their upper ends to said second frame (3), a puckering plate (49) to which the lower ends of each of said support legs (48) are fixed, said puckering plates (49) lying parallel to said support legs, said support legs and said puckering plates disposed in planes at right angles to the plane occupied by said second

frame (3), four frame expanding scREW assemblies (52—55) fixed to said first frame (63) to expand and contract said second frame (3), said screws (52) of the frame expanding screw assemblies respectively fixed to said puckering plates (49) of said holders and disposed in a common plane parallel to the plane occupied by said second frame (3), four drive shafts (45) extending one from each frame expanding screw assembly at right angles to the axes of said screws (52), a base (4), four driving heads (6) rotatably mounted on the base (4) engageable by said drive shafts (45), first drive means (34—43) on the base (4) to rotate the four driving heads (6), a sub-base (26), elevating means (30, 31, 33) connecting said base (4) and sub-base (26) whereby the sub-base (26) is raisable and lowerable relative to the base (4), four puckering assemblies (puckering belts 5 and support pulleys 21, 21a) mounted on the sub-base (26), a puckering belt (5) on each puckering assembly extending between a pair of said band support legs (48) and bearing on a puckering plate (49), second drive means (13—18) on said sub-base (26) to simultaneously drive all of said puckering belts (5) and said elevating means (30).

2. Stretch wrapping apparatus as claimed in Claim 1, wherein the second frame (3) comprises four members (46, 47) each with two legs at right angles with telescopic engagement between the ends of the band support legs (48) of the adjacent members.

3. Stretch wrapping apparatus as claimed in Claim 1 or Claim 2 wherein the puckering belt (5) of each puckering assembly is supported on a pair of pulleys (21, 21a) connected to the sub-base (26) through a parallel link assembly (23—25) enabling the puckering belt (5) to move towards and away from its associated puckering plate (49).

4. Stretch wrapping apparatus as claimed in any preceding claim wherein the elevating means comprises three jacking screws (30) engaged in nuts on the base (4), bearings (31) on the sub-base (26) with the upper ends of the jacking screws (30) mounted in the bearings (31) to allow rotary but not axial movement relative to the bearings.

5. Stretch wrapping apparatus as claimed in any preceding claim in combination with a wheeled transporter (2) for the second frame (3), two telescopic masts (72) on a base part (56), each mast having an outer part and an inner part, said first frame (63) fixed to two trolleys (76) respectively mounted one on each inner mast part, mast extending and contracting means (64, 170, 73) and trolley moving means.

6. Stretch wrapping apparatus as claimed in Claim 5 wherein the mast extending and contracting means comprises a motor (64), an endless chain (70) on each mast outer part driven by the motor, a connection (73) between each mast inner part (72) and the chain (70) of its associated mast outer part, and the trolley moving means comprises an endless wire rope (79) on each inner mast part, a connection between each mast outer part and the wire rope (79) of its associated inner

part and a trolley driving head (85) on each wire rope to drive the trolley (76) upwardly and releasable lever arm (88) on each trolley engageable with the driving head (85) when the trolley is to be driven downwardly.

# Patentansprüche

1. Dehnfolienumwickelapparat mit einer Formvorrichtung (1) zur Formung eines Abschnittes einer schlauchförmigen Kunststoffolie zu einem gefalteten Band aus einem rechteckigen Formrahmen, von dem der Kunststoff beim Führen des Rahmens über einen Gegenstand zur Bildung einer Umhüllung für den Gegenstand abgestreift wird, dadurch gekennzeichnet, daß der Dehnfolienumwickelapparat aus einem ersten rechteckigen Formrahmen (63), einem zweiten rechteckigen, ausziehbaren und zusammenziehbaren Formrahmen (3), einer Halterung (48, 49) an jeder Ecke des zweiten Rahmens (3) für ein gefaltetes Band aus Kunststoffolie, wobei jede Halterung ein Paar im Abstand angeordnete und an ihren oberen Enden and dem zweiten Rahmen (3) befestigte Bandhalterstäbe (48) und eine an die unteren Enden der Haltestäbe (48) angeschlossene Formplatte (49) aufweist, wobei die Formplatten (49) parallel zu den Haltestäben und die Haltestäbe samt den Formplatten in unter rechtem Winkel zu der von dem zweiten Rahmen (3) eingenommenen Ebene liegenden Ebenen angeordnet sind, aus vier am ersten Rahmen (63) befestigten Spindeltrieben (52 bis 55) zum Auseinander- bzw. Zusammenziehen des zweiten Rahmens (3), deren Spindeln (52) jeweils an den Formplatten (49) der Halterungen befestigt und in einer gemeinsamen, zur von dem zweiten Rahmen (3) eingenommenen Ebene parallelen Ebene angeordnet sind, aus vier Antriebswellen (45), die jeweils von einem der Spindeltriebe unter rechtem Winkel zur Achse der Spindel (52) verlaufen, einer Basis (4), vier an dieser drehbar gelagerten, mit den Antriebswellen (45) kupplebaren Antriebsköpfen (6), einer an der Basis (4) vorgesehenen ersten Antriebseinrichtung (34—43) zum Antrieb der vier Antriebsköpfe (6), einer Hilfsbasis (26) einer die Basis (4) und die Hilfsbasis (26) verbindenden Hubeinrichtung (30, 31, 33), wodurch die Hilfsbasis (26) bezüglich der Basis (1) heben und senkbar ist, vier an der Hilfsbasis (26) montierten Falteinheiten (Formbänder 5 und Stützrollen 21, 21a), einem Formband (5) an jeder Falteinheit, das zwischen einen Paar der Bandhalterstäbe (48) verläuft und sich an einer Formplatte (49) abstützt, und aus einer zweiten Antriebseinrichtung (13—18) an der Hilfsbasis (26) besteht, die zum gleichzeitigen Antrieb aller Formbänder (5) und der Hubeinrichtung (30) dient.

2. Apparat nach Anspruch 1, dadurch gekennzeichnet, daß der zweite Rahmen (3) aus vier teleskopartig aneinandergeschlossenen Teilen (46, 47) besteht, von denen jeder zwei zueinander rechtwinkelige Schenkel aufweist und zwischen den Enden der Bandhalterstäbe (48) der benachbarten Halterung angeordnet ist.

3. Apparat nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß das Formband (5) jeder Falt-einheit von einem Paar Stützrollen (21, 21a) abge-stützt ist, das mit der Hilfsbasis (26) über ein Parallelogrammgestänge (23—25) verbunden ist, um eine Bewegung des Formbandes (5) bezüglich der zugeordneten Formplatte (49) zu ermögli-chen.

4. Apparat nach den Ansprüchen 1 bis 3, da-durch gekennzeichnet, daß die Hubeinrichtung aus drei in Muttern an der Basis (4) eingreifenden Hubspindeln (30) und Lagern (31) an der Hilfsba-sis (26) besteht, wobei die oberen Enden der Hubspindeln (30) in den Lagern (31) diesbezüglich drehbar, jedoch axial unverschiebbar gelagert sind.

5. Apparat nach den Ansprüchen 1 bis 4, in Kombination mit einem Transportwagen (2) für den zweiten Rahmen (3), gekennzeichnet durch zwei Teleskopständer (72) auf einem Basisteil (56), von denen jeder einen Außenteil und einen Innenteil aufweist, wobei der erste Rahmen (63) an zwei Schlitten (76) befestigt ist, die jeweils an einem der Innenteile angebracht sind, durch eine Ständer-Ausschub- und Einzugsvorrichtung (64, 70, 73) und durch eine Schlitten-Verstell-vorrichtung.

6. Apparat nach Anspruch 5, dadurch gekenn-zeichnet, daß die Ständer-Ausschub- und ein-zugsvorrichtung einem Motor (64), eine von die-sem angetriebene endlose Kette (70) am Außen-teil, ein Verbindungsglied (73) zwischen jedem Innenteil (72) und der Kette (70) seines zugehöri-gen Außenteiles aufweist und daß die Schlitten-Verstellvorrichtung ein endloses Drahtseil (79) an jedem Innenteil, ein Verbindungsglied zwischen jedem Außenteil und dem Drahtseil (79) seines zugeordneten Innenteiles, einen Kupplungskopf (85) an jedem Drahtseil zum Aufwärtsbewegen des Schlittens (76) und einen lösbaren Hebelsarm (88) an jedem Schlitten aufweist, der bei abwärts zu bewegendem Schlitten an dem Kupplungskopf (85) angreift.

## Revendications

1. Appareil d'enveloppement dans un film ex-tensible, comprenant un dispositif (1) de fronçage destiné à donner à une longueur de matière de film plastique, ayant la forme d'un tube, la forme d'une bande froncée sur un cadre rectangulaire de fronçage, dont la matière plastique est enlevée lorsque le cadre passe au-dessus d'un objet afin d'assurer ainsi un enveloppement d'emballage de l'objet, appareil caractérisé en ce que cet appareil d'enveloppement dans un film extensible com-prend un premier cadre rectangulaire (63) de fronçage, un second cadre (3) rectangulaire, ex-pansible et contractable, de fronçage, un disposi-tif (48, 49) pour maintenir une bande froncée de film plastique à chaque coin du second cadre (3), chaque dispositif de maintien comprenant une paire de pieds (48) de support de bande, espacés et fixés par leur extrémité supérieure audit second cadre (3), une plaque (49) de fronçage à

laquelle les extrémités inférieures de chacun des-dits pieds (48) de support sont fixées, lesdites plaques (49) de fronçage étant parallèles auxdits pieds de support, lesdits pieds de support et lesdites plaques de fronçage étant disposés dans des plans perpendiculaires au plan occupé par ledit second cadre (3), quatre ensembles (52—55) à vis pour expansion de cadre, fixés audit premier cadre (63) pour provoquer l'expansion et la contraction dudit second cadre (3), lesdites vis (52) des ensembles à vis pour l'expansion du cadre étant respectivement fixées auxdites pla-ques (49) de fronçage desdits dispositifs de main-tien et étant disposées dans un plan commun parallèle au plan occupé par ledit second cadre (3), quatre arbres (45) d'entraînement s'étendant à partir de chaque ensemble à vis pour expansion de cadre perpendiculairement aux axes desdites vis (52), une base (4), quatre têtes (6) d'entraî-ne-ment montées sur la base (4) de manière à pouvoir tourner et à venir au contact desdits arbres (45) d'entraînement, un premier dispositif (34—43) d'entraînement sur la base (4), destiné à faire tourner les quatre têtes (6) d'entraînement, une base inférieure (26), un dispositif élévateur (30, 31, 33), relié à ladite base (4) et à la base inférieure, ce qui permet d'élever la base inférieure (26) et de l'abaisser par rapport à la base (4), quatre ensembles de fronçage (courroies (5) de fronçage et poulies (21, 21a)) de support montées sur la base inférieure (26), une courroie (5) de fronçage de chaque ensemble de fronçage s'éten-dant entre deux desdits pieds (48) de support de bande et s'appuyant sur une plaque (49) de fronçage, un second dispositif (13—18) d'entraî-nement sur ladite base inférieure (26) pour entraî-ner simultanément la totalité des courroies (5) de fronçage et ledit dispositif élévateur (30).

2. Appareil d'enveloppement dans un film ex-tensible selon la revendication 1, dans lequel le second cadre (3) comprend quatre éléments (46, 47) dotés chacun de deux pieds perpendiculaires avec engagement télescopique entre les extré-mités des pieds (48) de support de bande des éléments adjacents.

3. Appareil d'enveloppement dans un film ex-tensible selon la revendication 1 ou la revendica-tion 2, dans lequel la courroie (5) de fronçage de chaque ensemble de fronçage est supportée sur une paire de poulies (21, 21a) reliées à la base inférieure (26) par un ensemble de bielles paral-lèles permettant de déplacer la courroie (5) de fronçage pour la rapprocher et l'éloigner de la plaque (49); de fronçage qui lui est associée.

4. Appareil d'enveloppement dans un film ex-tensible selon l'une quelconque des reven-dications précédentes, dans lequel le dispositif élévateur comprend trois vis (30) de mise à niveau en prise avec des écrous de la base (4), des paliers (31) sur la base inférieure (6), les extré-mités supérieures des vis (30) de mise à niveau étant montées dans les paliers (31) de façon à permettre un mouvement de rotation, mais non pas un mouvement axial, par rapport aux paliers.

5. Appareil d'enveloppement dans un film ex-

tensible selon l'une quelconque des revendications précédentes, en combinaison avec un transporteur (2) à roues pour le second cadre (3), comprenant deux mâts télescopiques (72) sur une base (56), chaque mât ayant une partie externe et un partie interne, ledit premier cadre (63) étant fixé à deux chariots ou trolleys (76) respectivement montés sur chaque partie interne de mât, un dispositif (75, 70, 73) d'extension et de contraction de mât, et un dispositif pour faire déplacer les chariots ou trolleys.

6. Appareil d'enveloppement dans un film extensible selon la revendication 5, dans lequel le dispositif d'extension et de contraction de mâts comprend un moteur (64), une chaîne (70) sans

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fin sur chaque partie externe de mât entraînée par le moteur, un élément de liaison (73) entre chaque partie interne (72) de mât et la chaîne (70) de la partie externe de mât qui lui est associée, et un dispositif de déplacement de trolleys ou chariots comprenant un câble (79) sans fin sur chaque partie interne de mât, un élément de liaison entre chaque partie externe de mât et le câble (79) de la partie interne qui lui est associée ainsi qu'une tête (85) d'entraînement de chariot, sur chaque câble, en vue d'entraîner le chariot (76) vers le haut et un bras de levier (88) dégageable, présent sur chaque chariot, pouvant venir au contact de la tête (85) d'entraînement lorsque le chariot doit être entraîné vers le bas.



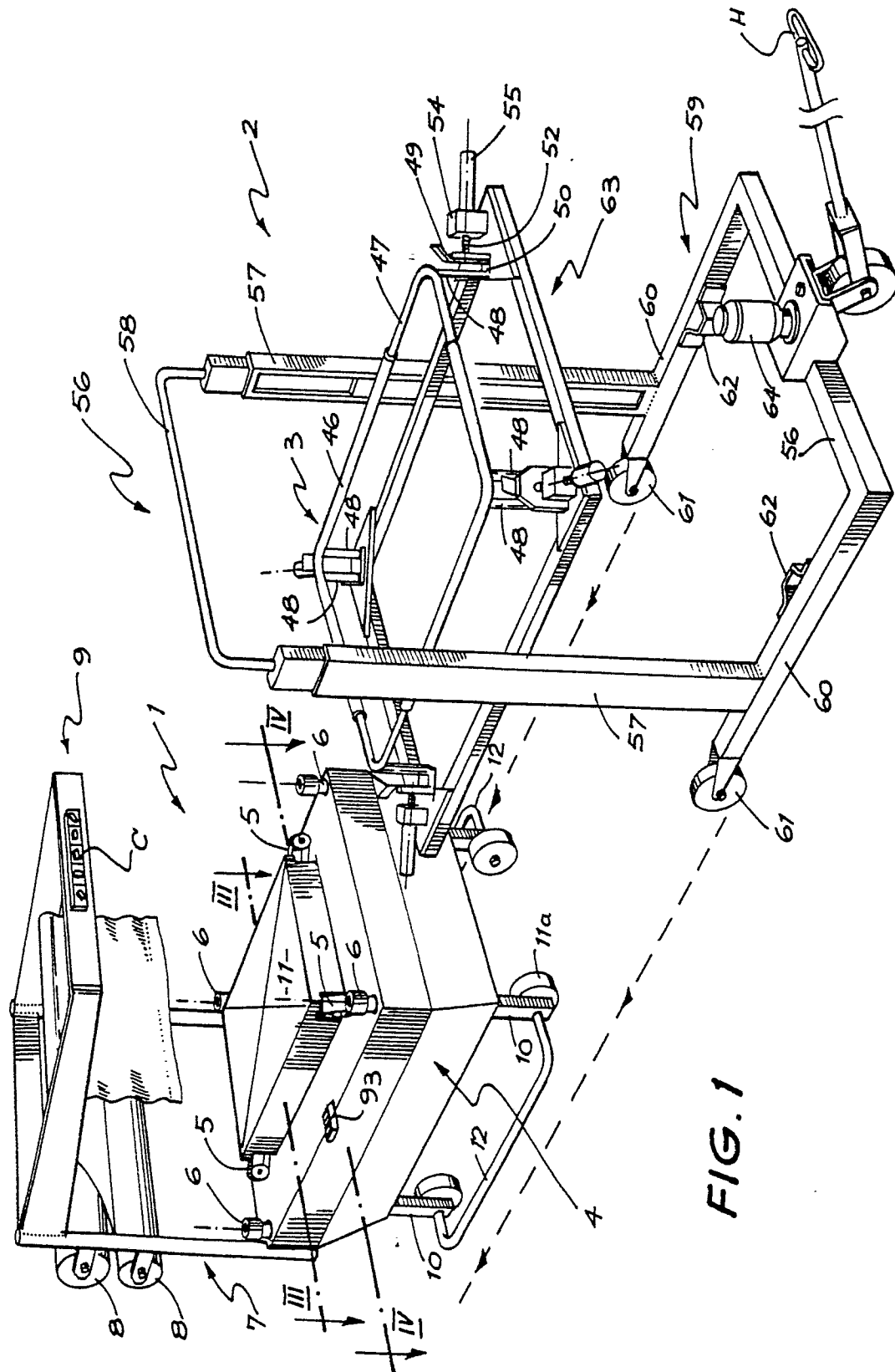
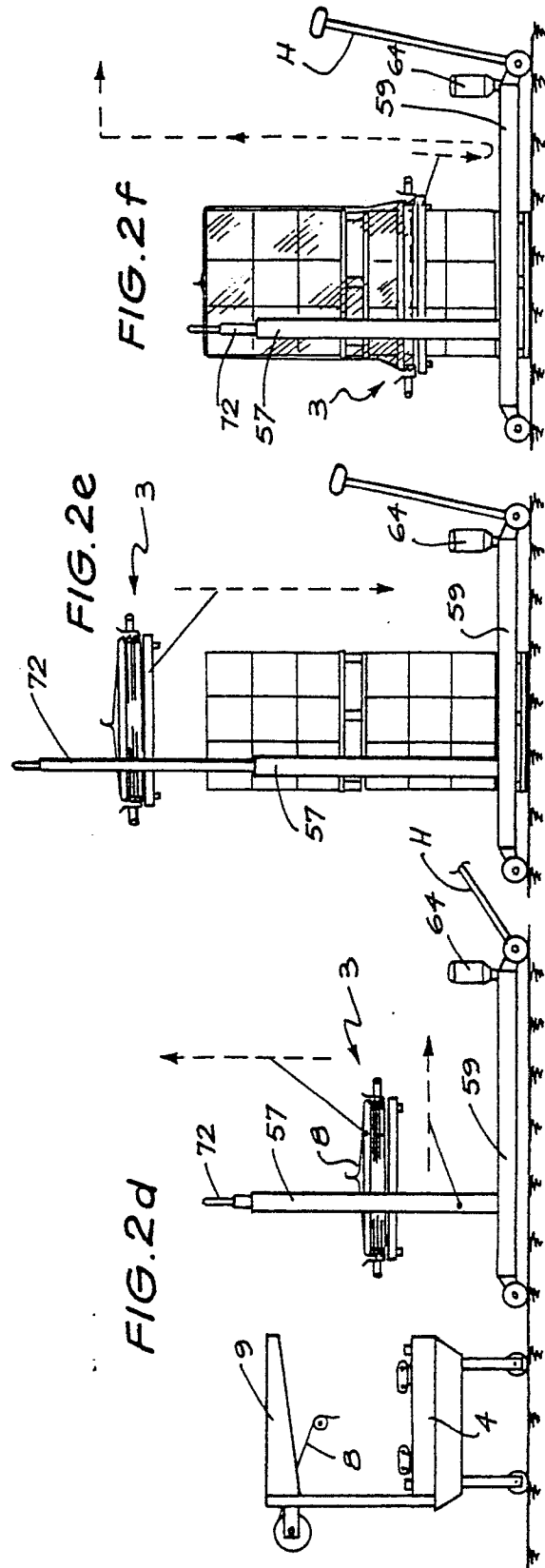
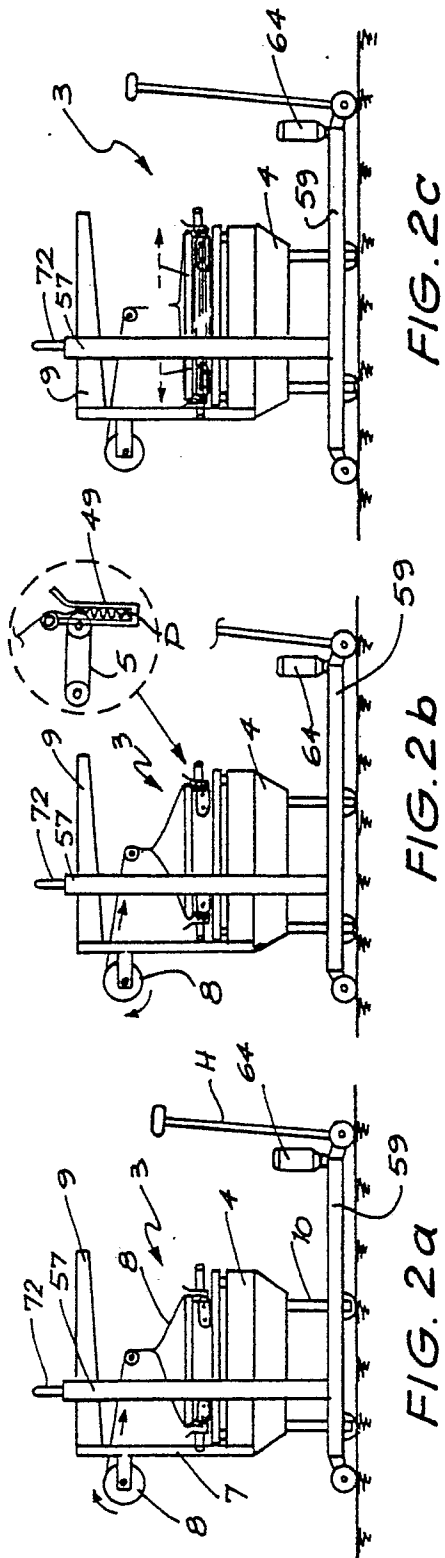


FIG. 1



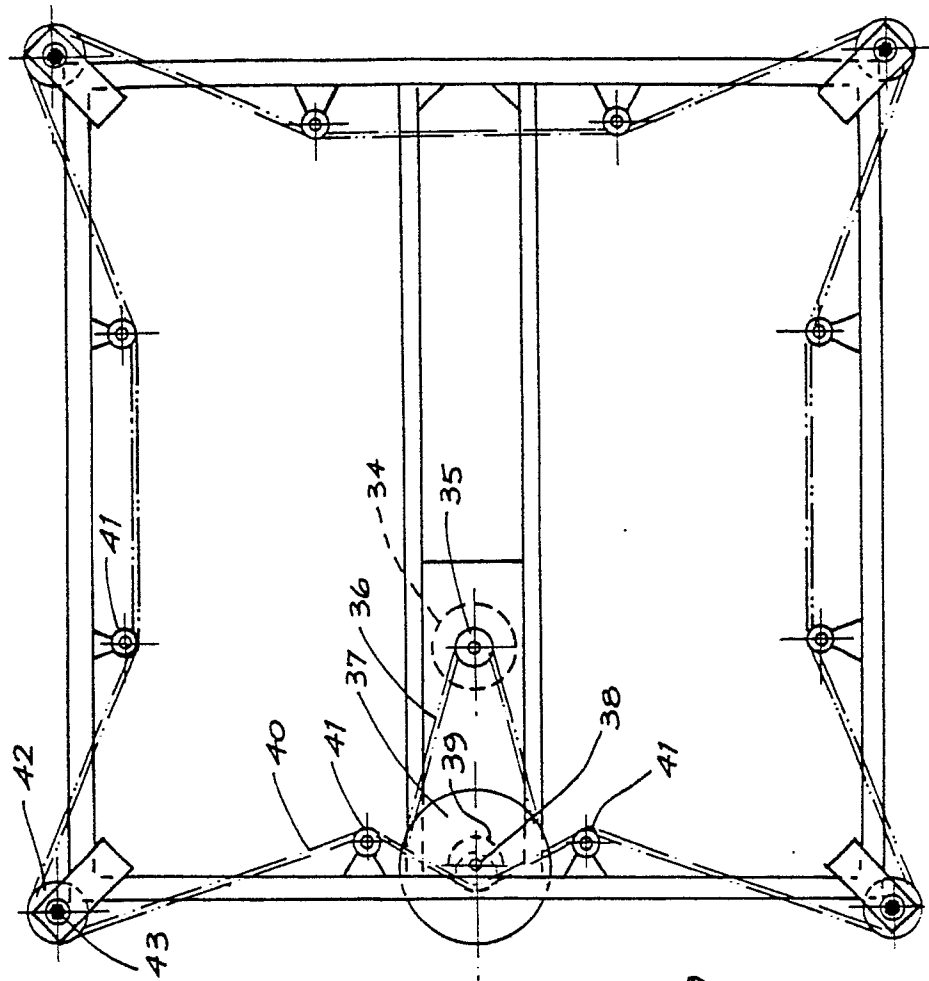


FIG. 4

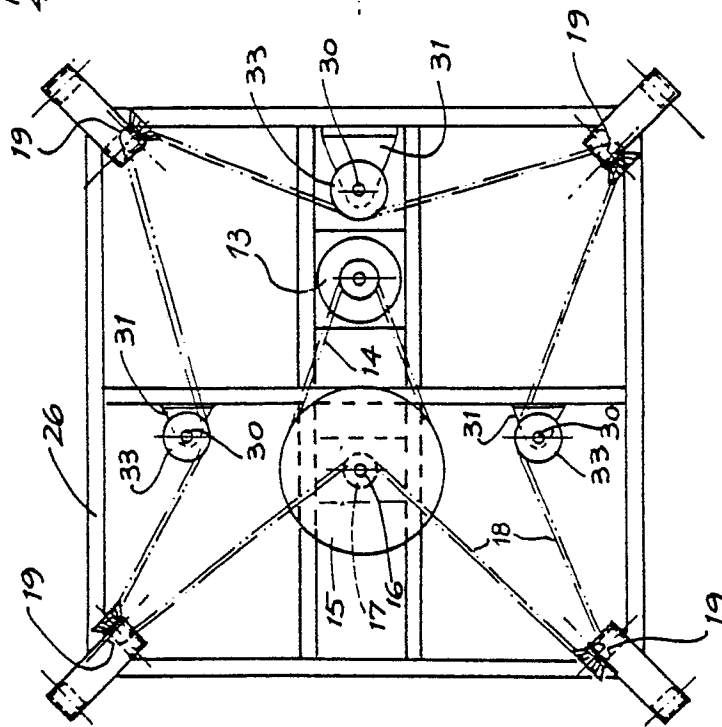
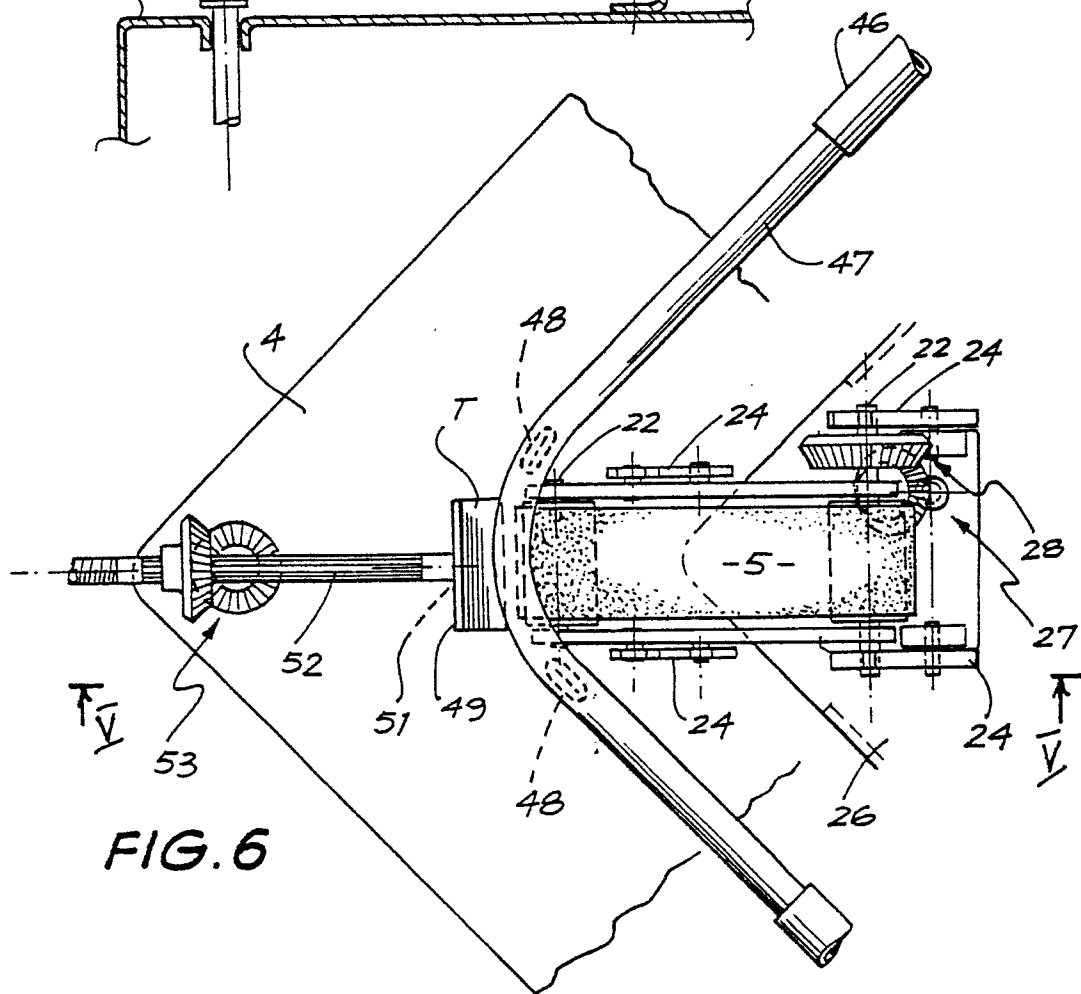
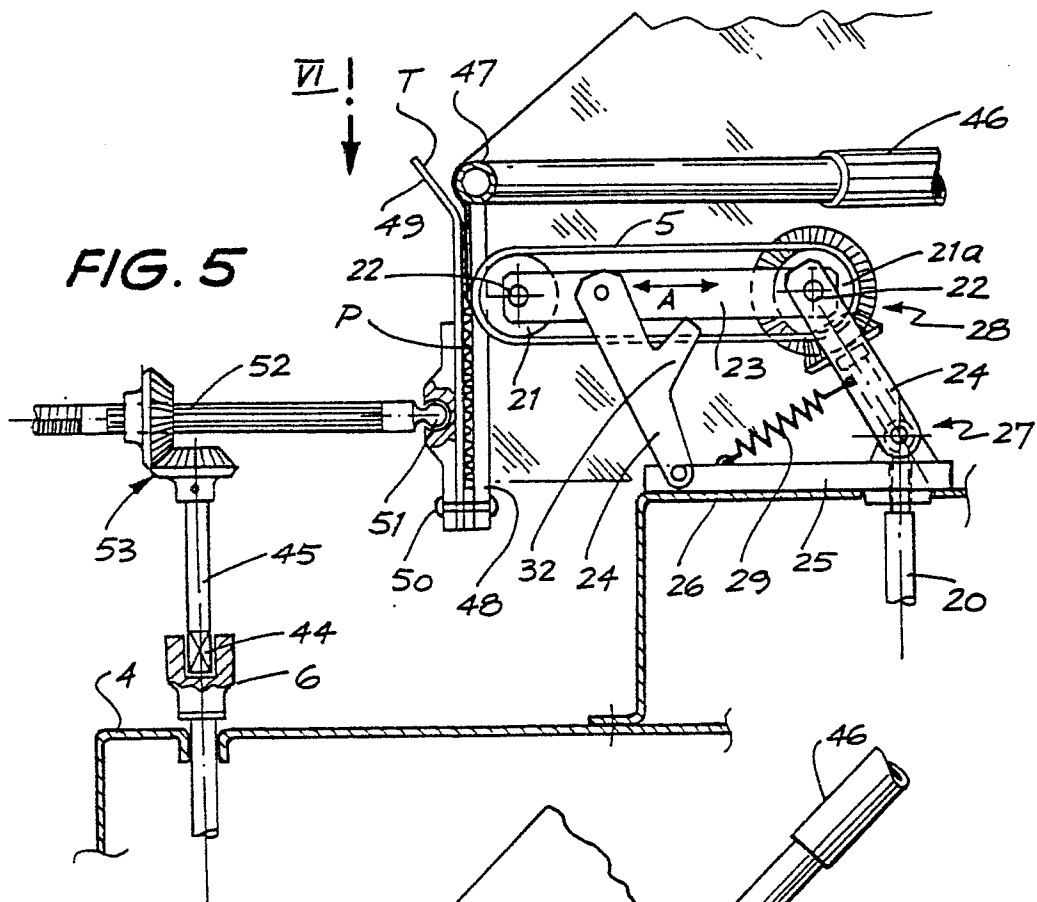
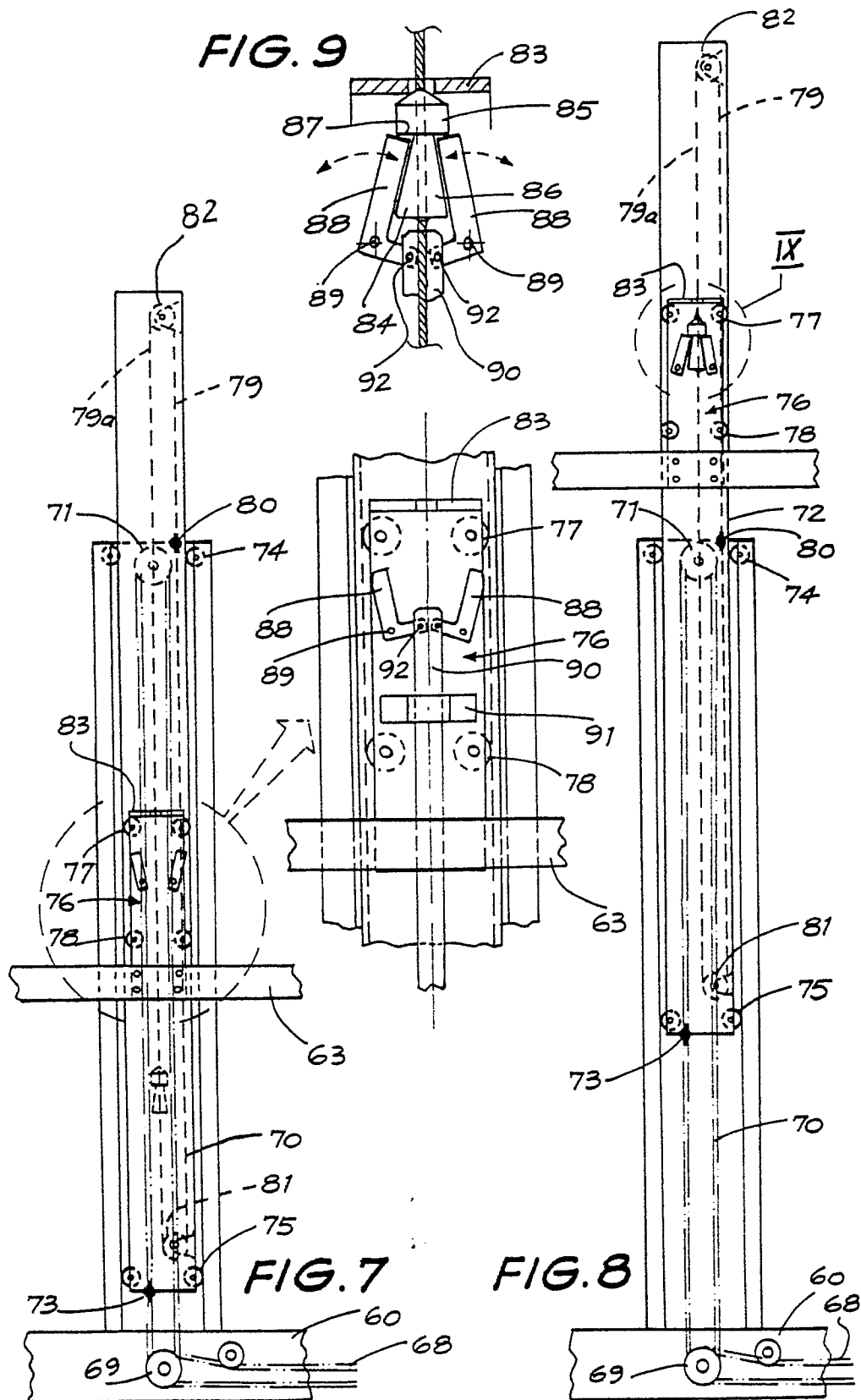


FIG. 3





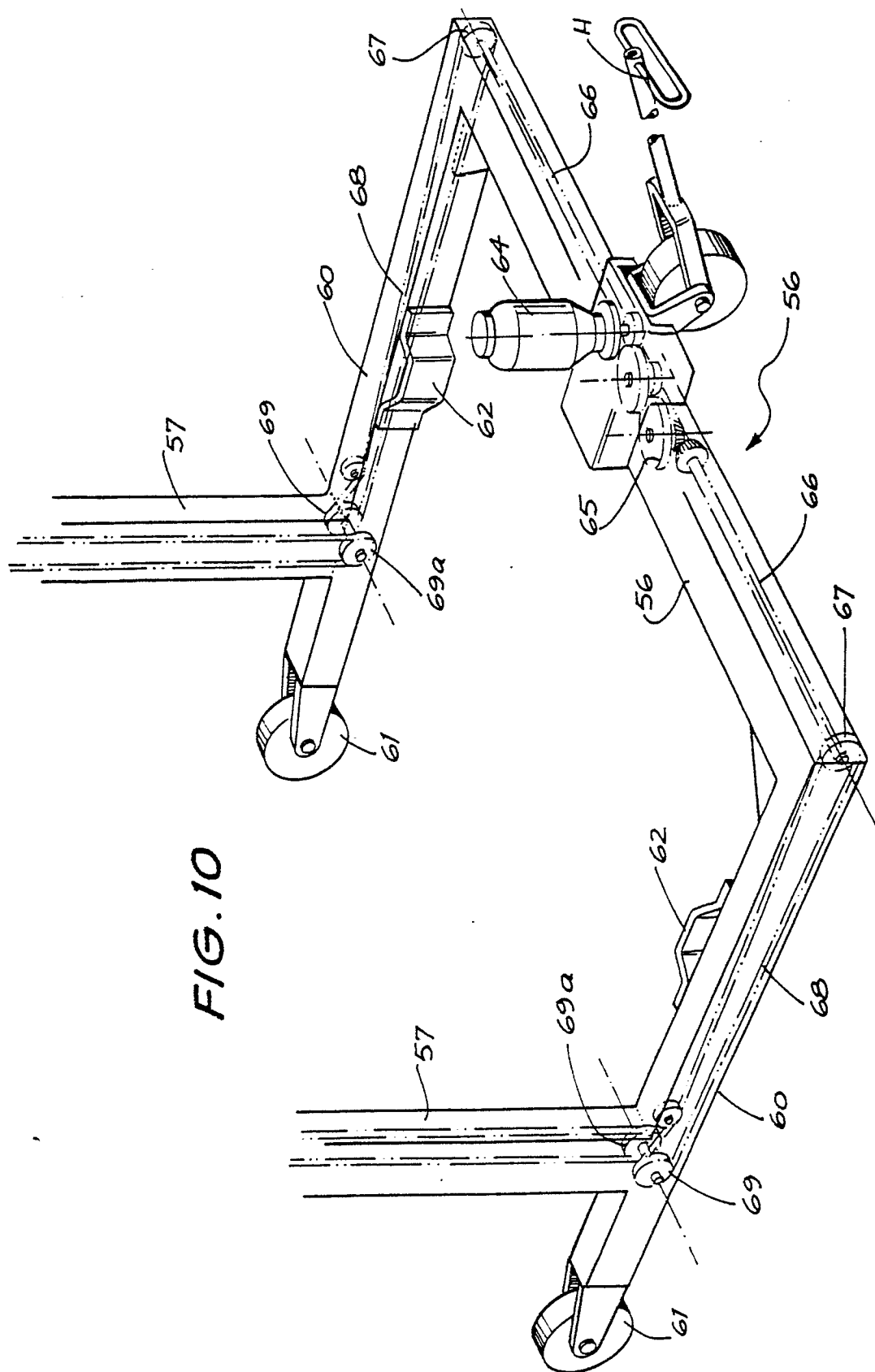


FIG. 10